MARS PATHFINDER

Landed Safely
bounced
15-20 time
Richest part
Mars
Demo - robus
inexpensive
landing system
low-cost
quick

SURFACE OPERATIONS ~3 MONTHS

3 Science Instruments - IMP, APXS, ASI/MET
Rover - 3 Imagers
~10 Technology Experiments

RETURNED ~~2.6~~ 2.3 Gbits DATA

>16,000 IMP Images
>550 Rover Images
16 Chemical Analyses Rocks and Soil; 9 Rocks
8.5 Million P, T, Wind Measurements

ROVER

Circumnavigated Lander, Traversed ~100 m
Explored ~200 Square Meters of Surface
234 Commanded Movements, 24 Soil Mechanics Experiments

CAPTURED IMAGINATION OF PUBLIC

Front Page Headlines for a Week
566 Mhits First 30 Days; 47 Mhits on July 8th
Largest Internet Event in History

TOP 6 SCIENCE RESULTS

HIGH SILICA ROCKS

Differentiated Parent Materials

ROUNDED PEBBLES, COBBLES AND POSSIBLE CONGLOMERATE

Suggest Fluvial Processes Over Long Time *Sand*

Liquid Water in Equilibrium w/Atmosphere Warmer/Wetter Past

MOMENT OF INERTIA 0.365±0.003

Metallic Core >1300 km Radius <~2000 km Radius

AIRBORNE DUST MAGNETIC

Composite Particles, [redacted] Magnetic Mineral, Likely Maghemite

Freeze Dried Precipitate (Stain or Cement)

Iron Leached from Crust by Active Hydrologic Cycle

LANDING SITE AS PREDICTED FROM REMOTE SENSING AND ANALOG

Rocky Plain Safe for Landing and Roving

Variety of Rocks Deposited by Flood, Relatively Dust Free

ATMOSPHERE

Water Ice Clouds; Dust Devils

Abrupt T Fluctuations with Time and Height in Morning

SCIENCE INVESTIGATIONS & OPS GROUPS

GEOLOGY AND GEOMORPHOLOGY — Depositional Plain

Lander and Rover Imaging — Ventifacts, Sand Dunes

Aerodynamic Roughness - Wind Socks — Exhumed Surface

MINERALOGY AND GEOCHEMISTRY — Soil - Chemically Similar

APXS, IMP Spectra and Rover Close Up Imaging — Rocks - Andesites, dust

Conglomerates, other Rocks

MAGNETIC PROPERTIES — Composite Particles

Multispectral Imaging, [APXS of dust and ramp magnets] — Maghemite Stain

SURFACE MATERIALS PROPERTIES — Compressional Drift - Eolian

Imaging-rover tracks, Wheel Torques, Soil Mechanics — Cloddy - Fluvial ?

ATMOSPHERIC SCIENCE — Upper Atmosphere cold

Entry and Descent Data - Atmospheric Profile — Lower - dusty, warm

Surface Meteorology - ASI/MET Data — Barometric Min - Sol 20, Semi diurn.

Morning T fluctuations t + h

Dust Devils - P↓; Imaged

ATMOSPHERIC IMAGING

Atmospheric Aerosols - Dust, Clouds, H_2O vapor

μ — H_2O ice — 10 PPM

ROTATIONAL & ORBITAL DYNAMICS

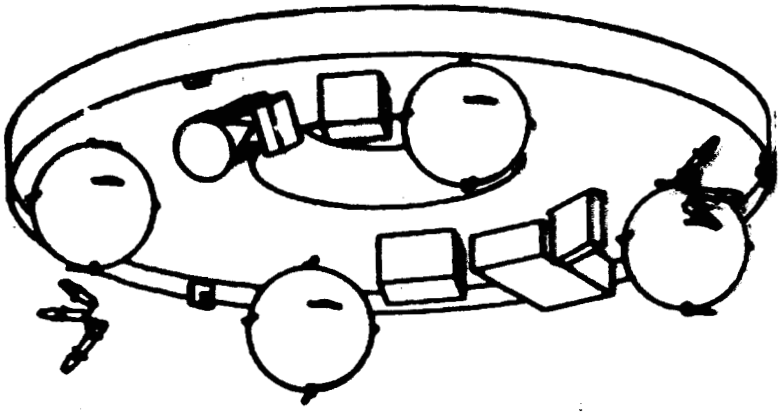
Telecommunications System — Location, Pole, Precession, Moment of Inertia

Central Metallic core 1300 - 2000 km Radius

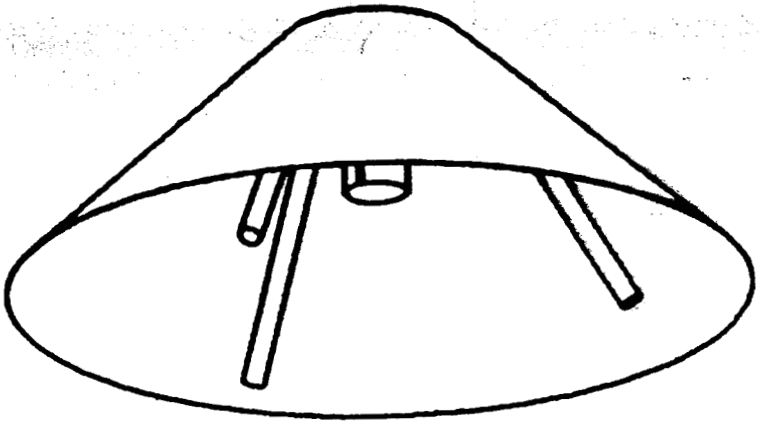
~2400

E[illegible] Wet + Warm — Annual Variation [illegible]

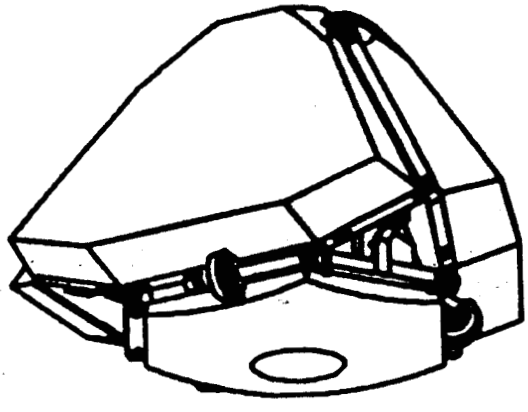
MARS Pathfinder (Exploded View)



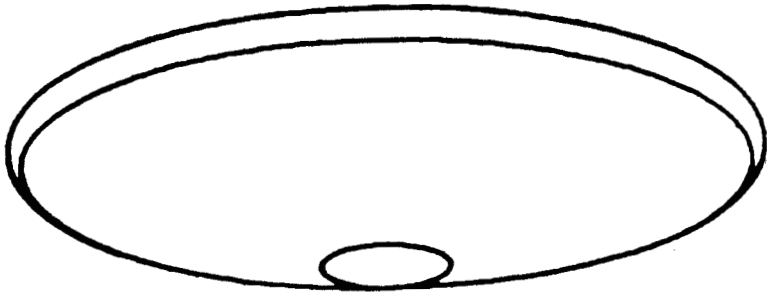
Cruise Stage



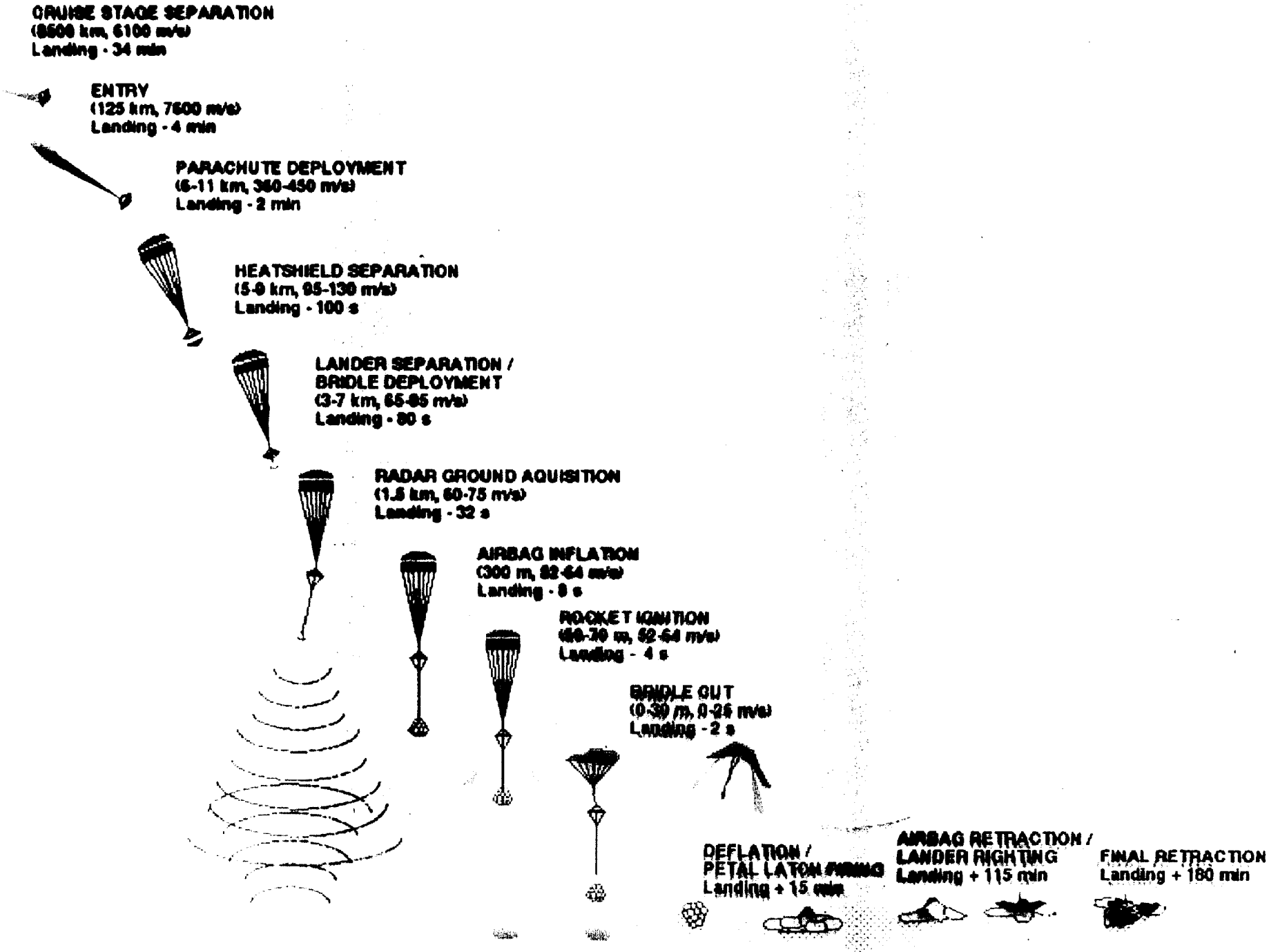
Backshell

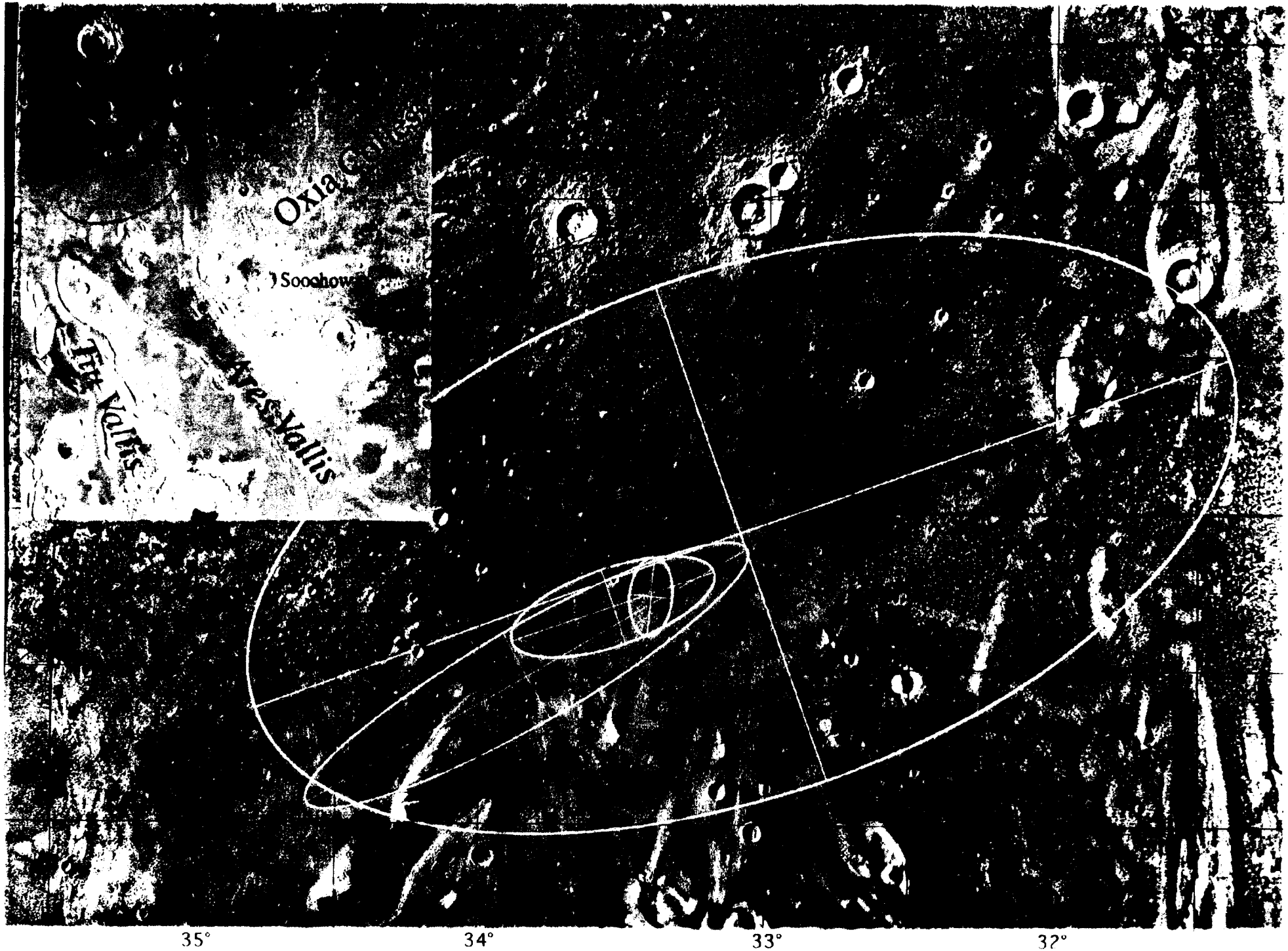


Lander



Heatshield


CRUISE STAGE SEPARATION
(8500 km, 6100 m/s)
Landing - 34 min
ENTRY
(125 km, 7600 m/s)
Landing - 4 min
PARACHUTE DEPLOYMENT
(6-11 km, 360-450 m/s)
Landing - 2 min
HEATSHIELD SEPARATION
(5-9 km, 85-130 m/s)
Landing - 100 s
LANDER SEPARATION /
BRIDLE DEPLOYMENT
(3-7 km, 65-85 m/s)
Landing - 80 s
RADAR GROUND AQUISITION
(1.5 km, 60-75 m/s)
Landing - 32 s
AIRBAG INFLATION
(300 m, 52-64 m/s)
Landing - 8 s
ROCKET IGNITION
(60-70 m, 52-64 m/s)
Landing - 4 s
BRIDLE CUT
(0-30 m, 0-25 m/s)
Landing - 2 s
DEFLATION /
PETAL LATCH FIRING
Landing + 15 min
AIRBAG RETRACTION /
LANDER RIGHTING
Landing + 115 min
FINAL RETRACTION
Landing + 180 min

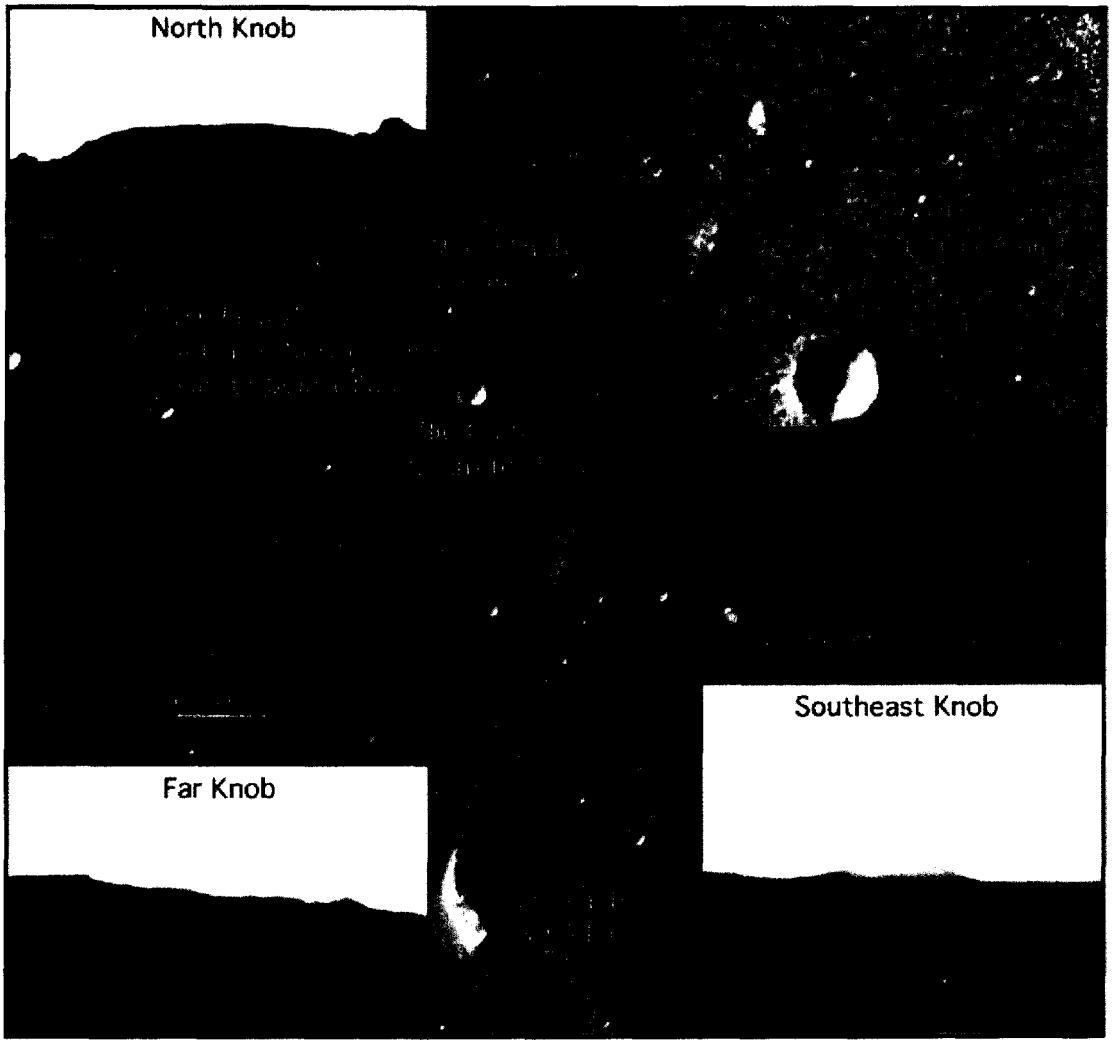

21°
20°
19°
35°
34°
33°
32°
Oxia C
Sooshow
Tiu Vallis
Ares Vallis

Super Resolution Image of "Big Crater" by Dr. Timothy Parker, JPL

Super Resolution of Big Crater - Medium Resolution 850 KB

Super Resolution of Big Crater - Full Resolution 2440 KB

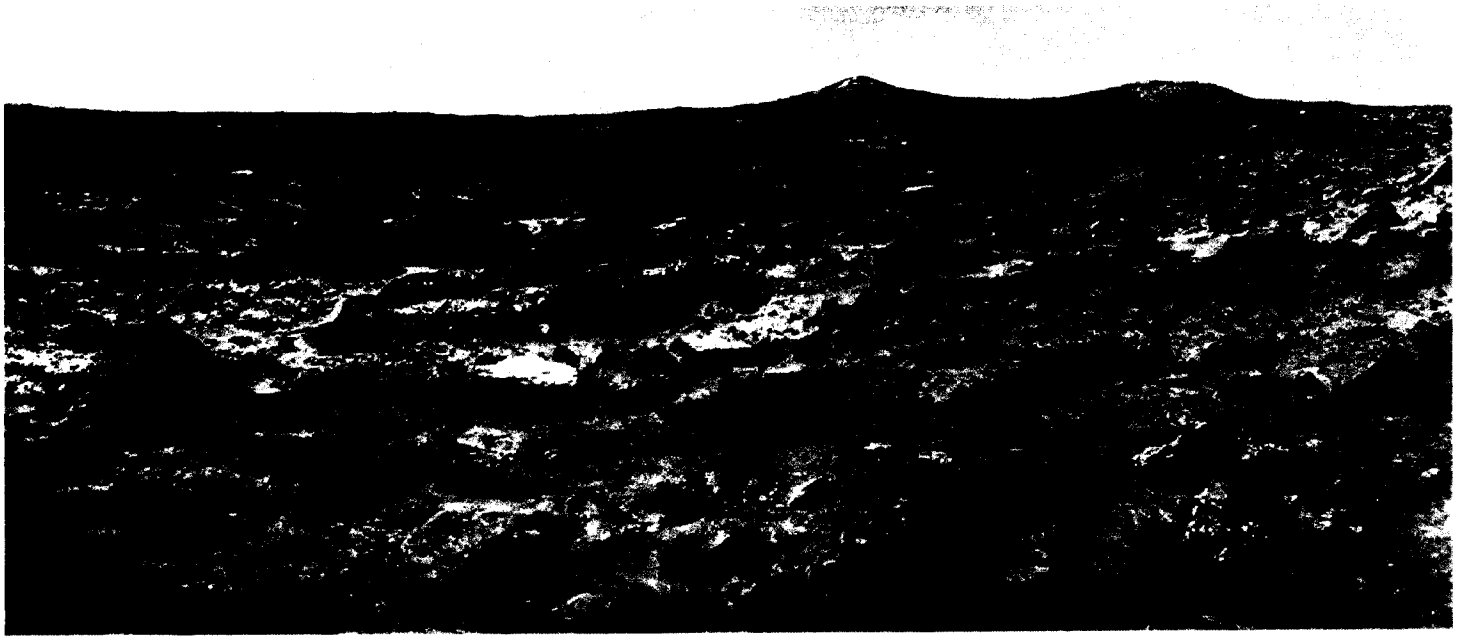
For Location of Big Crater See Map Below

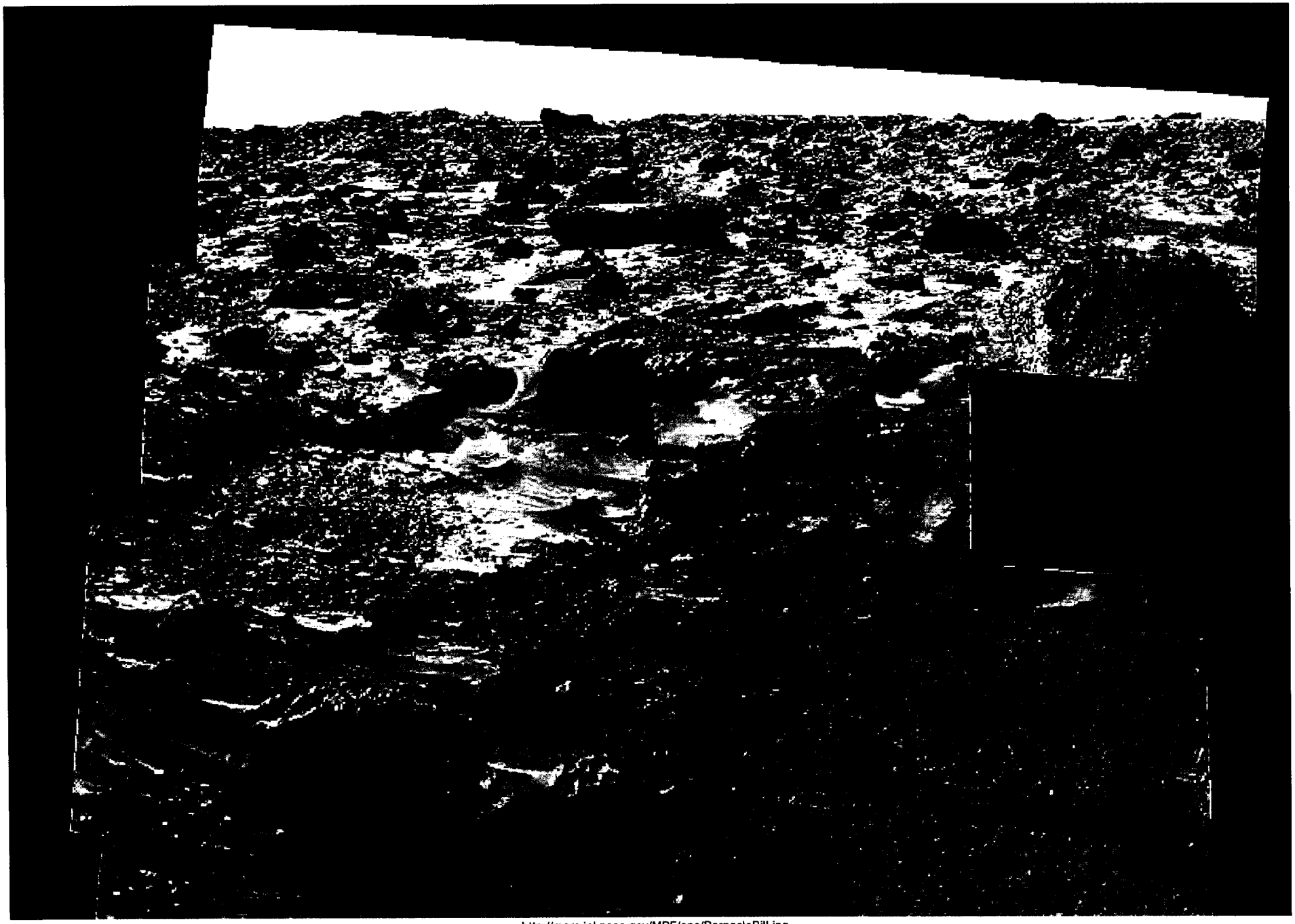


PIA01124_29418.jpg

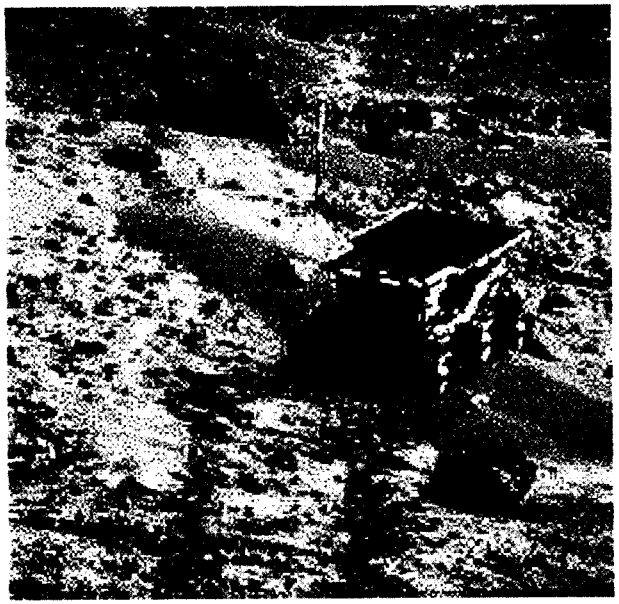
Mars Pathfinder Landing Site Catalog #: PIA01124

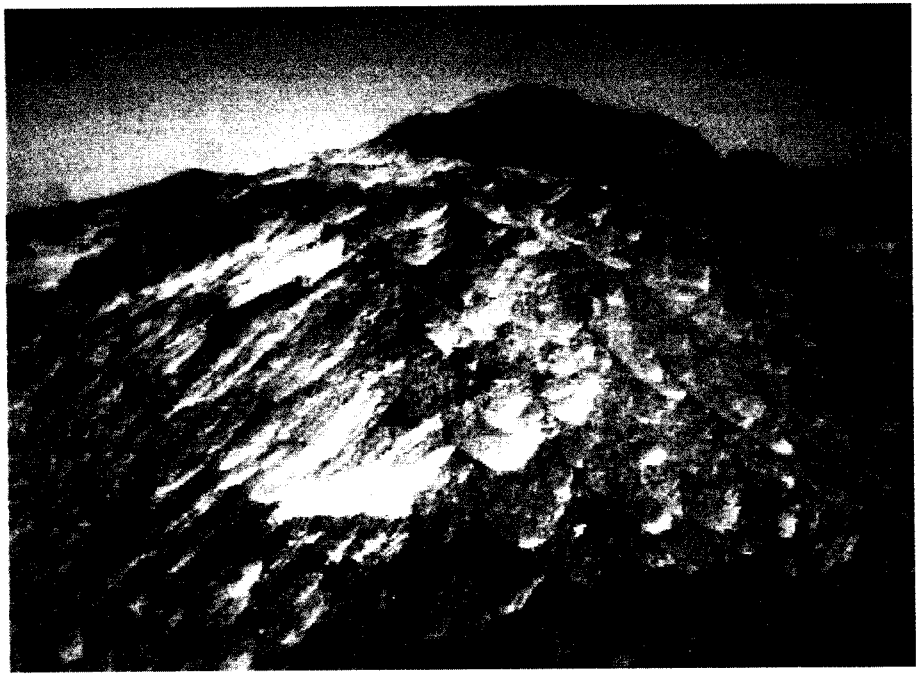
Mosaic of Viking orbiter images illustrating the location of the lander (19.17 degrees N, 33.21 degrees W in the USGS reference frame) with respect to surface features. Five prominent features on the horizon include North Knob, Southeast Knob, Far Knob, Twin Peaks, and Big Crater. Two small craters visible in the orbiter and lander views--Little Crater and Rimshot Crater--lie on the northwest outer flank of the rim of Big Crater. Because the lander is on the southeast-facing flank of a low ridge, very distant features to the south and east are in view, whereas relatively nearby features to the north are partially or completely obscured. Only the tip of North Knob, which appears larger in the Viking orbiter images than the Twin Peaks, projects above the local horizon, and a 300-m crater, 1.2 km to the northeast, is completely obscured. Viking stereo images 004A27 and 004A87 and 004A44 and 004A70. North is up; scale bar, 5 km. (Insets) (Upper right) Lander location. (Upper left) North Knob from lander. (Lower left) Far Knob from lander. (Lower right) Southeast Knob from lander. The location of the lander in inertial





http://mars.jpl.nasa.gov/MPF/ops/BarnacleBill.jpg



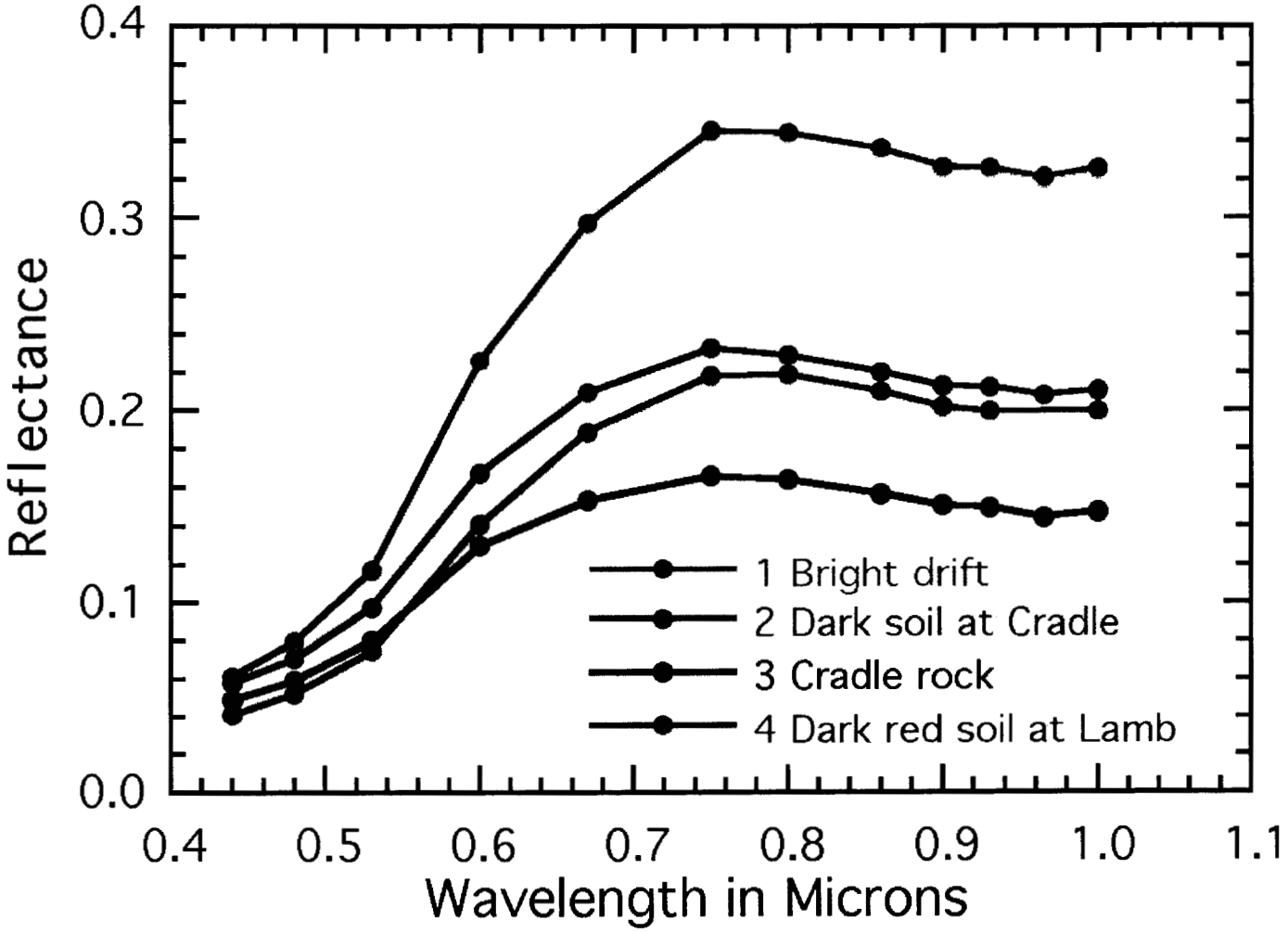


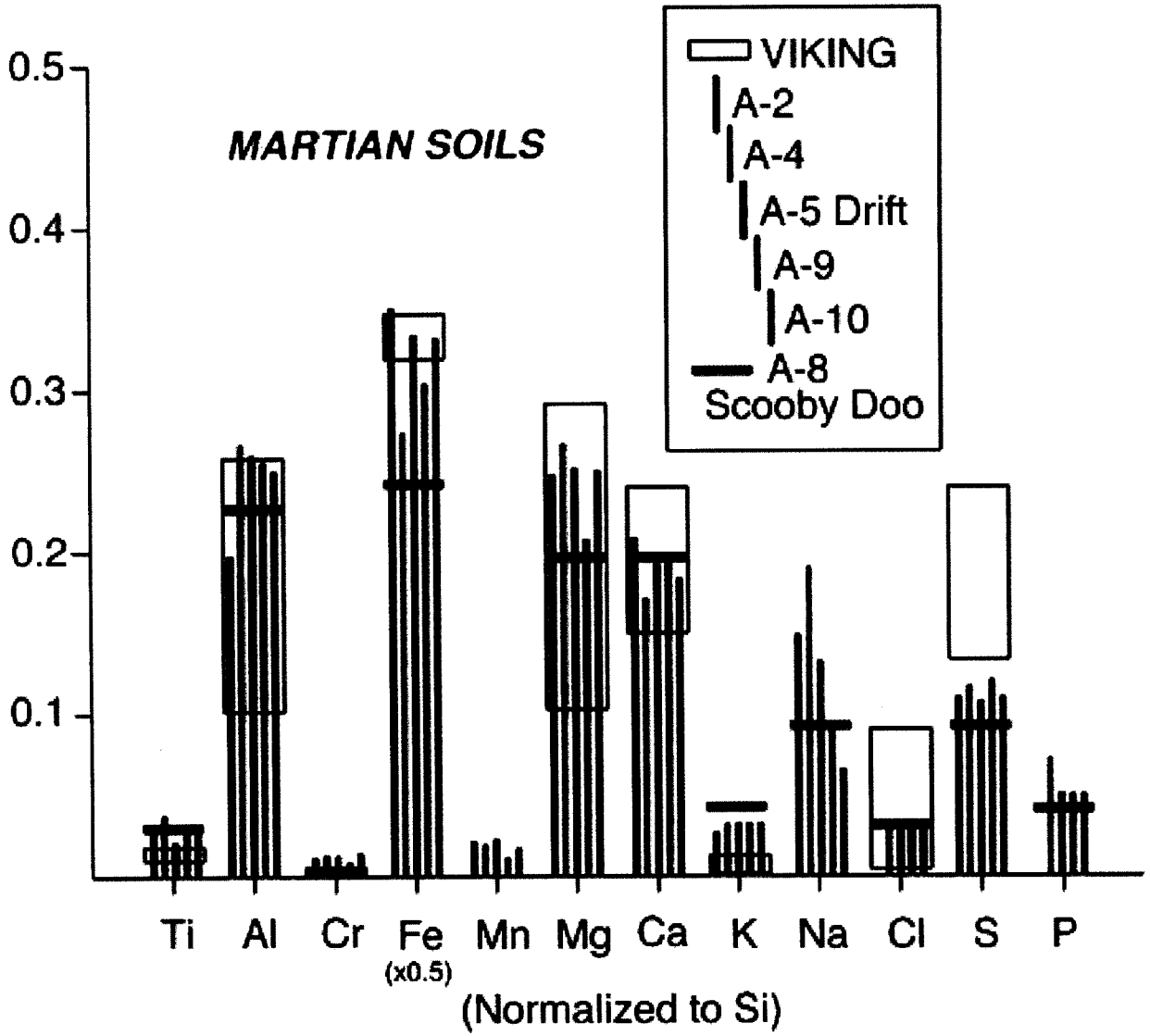
JPEG image 665x369 pixels

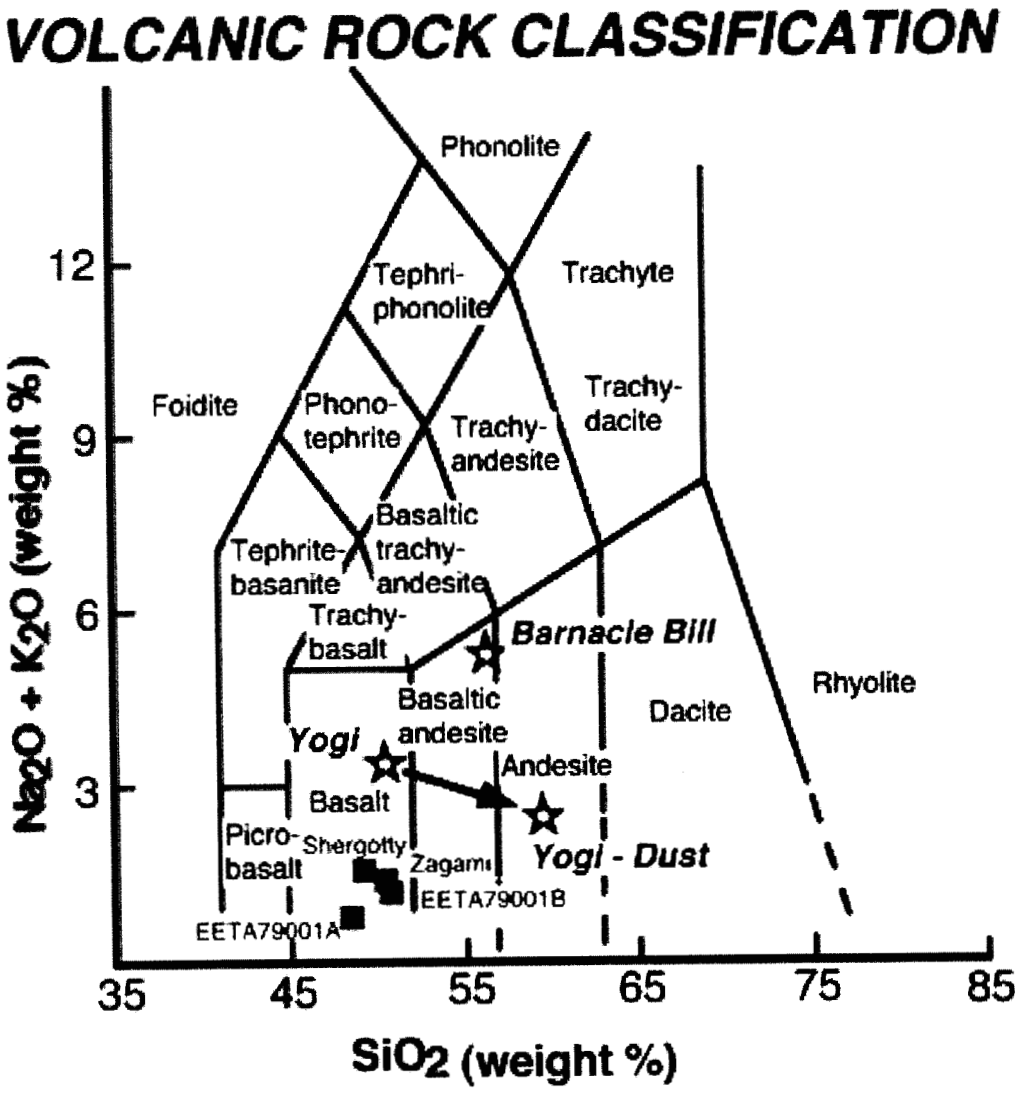
Thursday, May 18, 2000

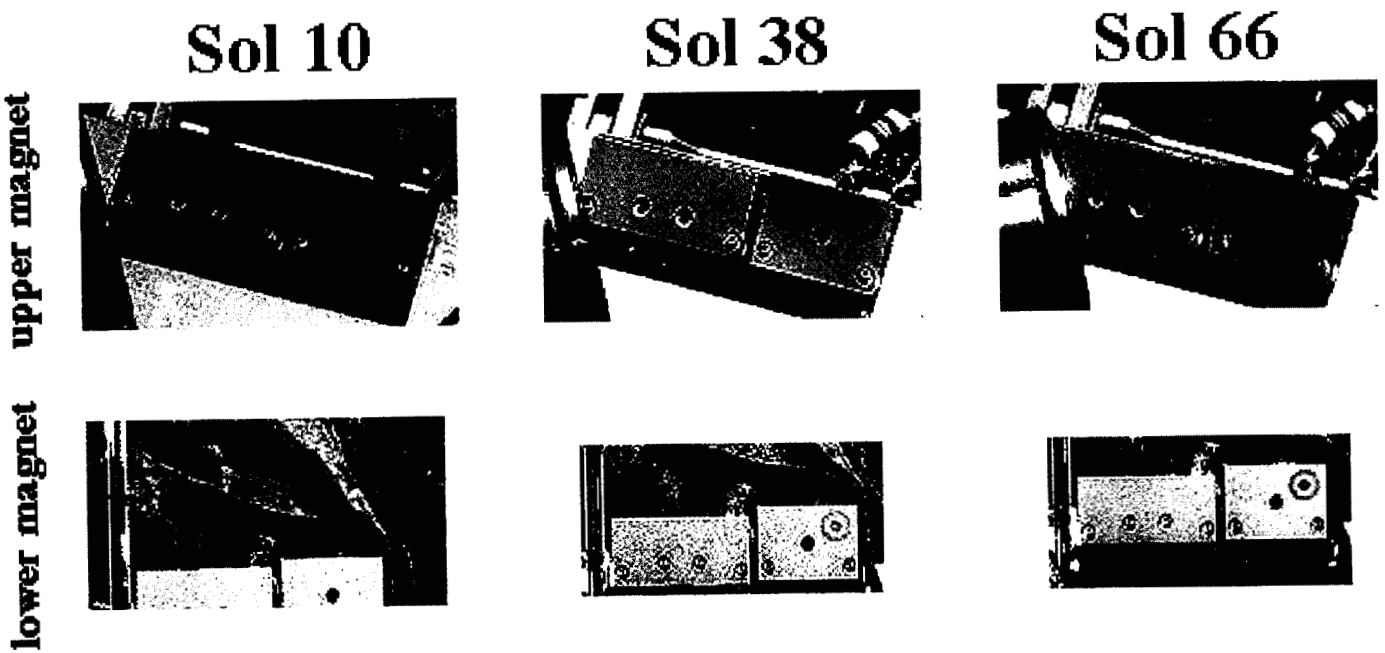
http://mars.jpl.nasa.gov/MPF/ops/yogi-pres-col-2.jpg

Diversity in Rover Deployment Area

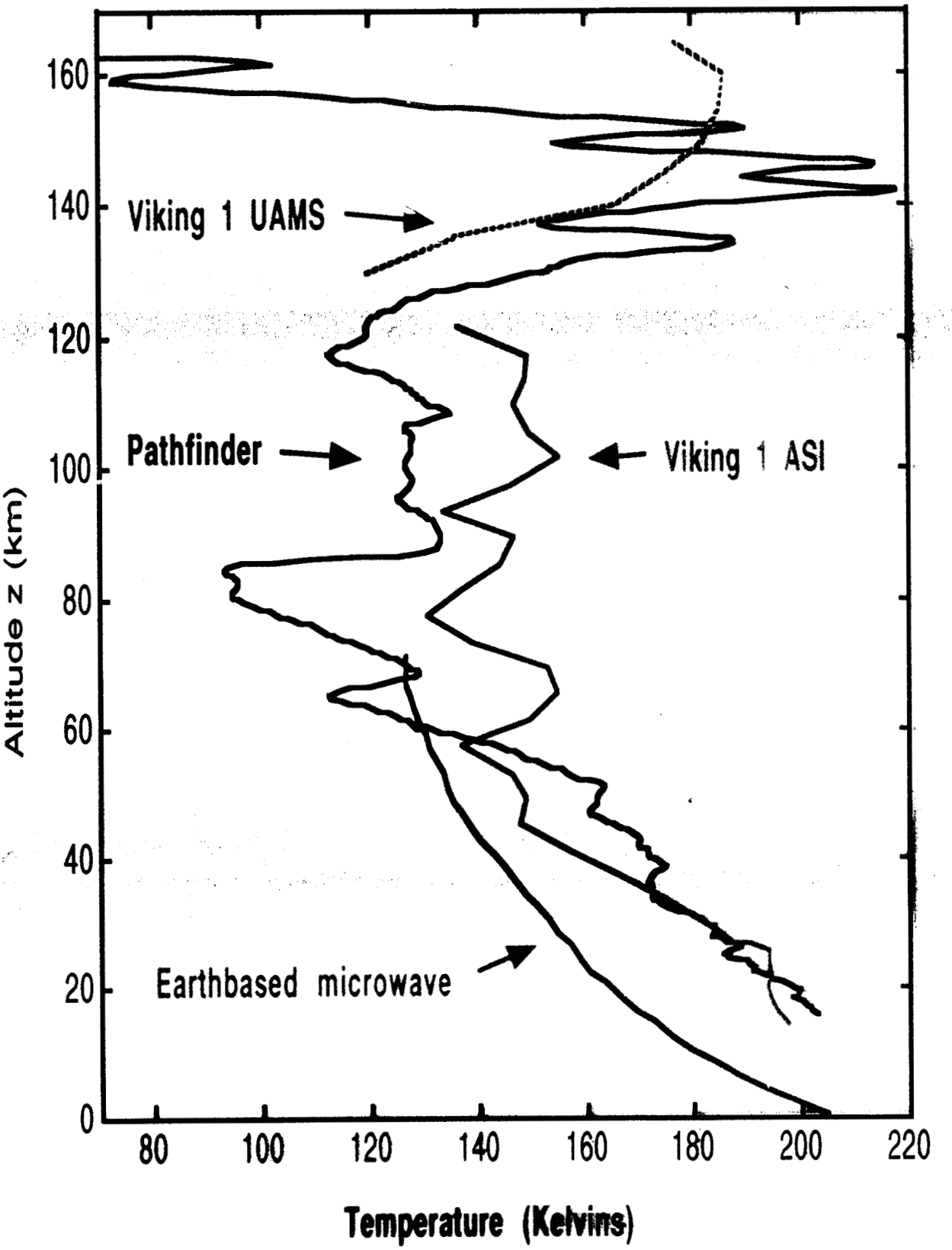


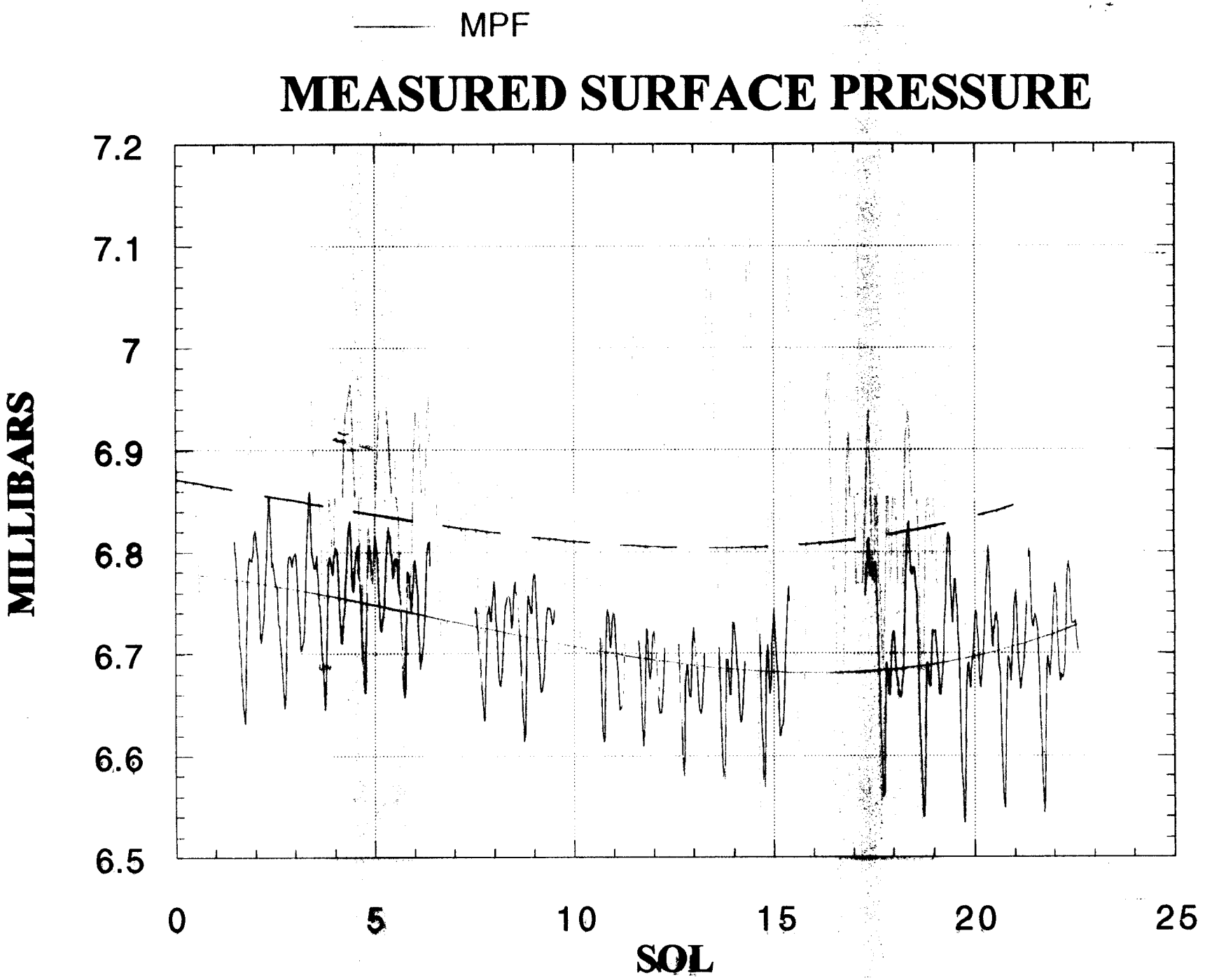

MARTIAN SOILS
VIKING
A-2
A-4
A-5 Drift
A-9
A-10
A-8
Scooby Doo
0.5
0.4
0.3
0.2
0.1
Ti
Al
Cr
Fe
(x0.5)
Mn
Mg
Ca
K
Na
Cl
S
P
(Normalized to Si)

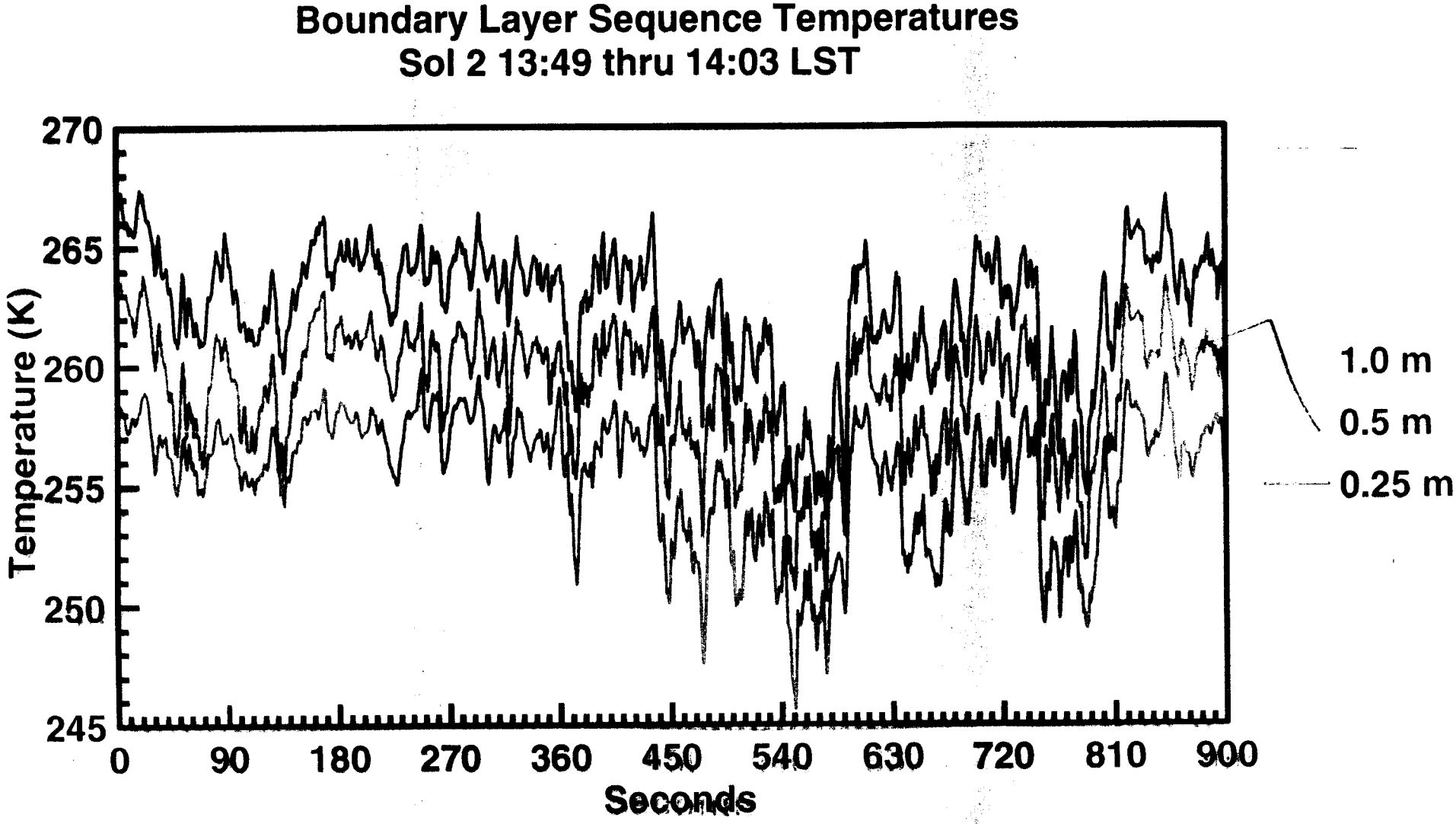

VOLCANIC ROCK CLASSIFICATION
Phonolite
Tephri-phonolite
Trachyte
Foidite
Phono-tephrite
Trachy-andesite
Trachy-dacite
Basaltic trachy-andesite
Tephrite-basanite
Trachy-basalt
Barnacle Bill
Rhyolite
Basaltic andesite
Dacite
Yogi
Andesite
Basalt
Picro-basalt
Shergotty
Zagami
Yogi - Dust
EETA79001B
EETA79001A
12
9
6
3
35
45
55
65
75
85
Na2O + K2O (weight %)
SiO2 (weight %)

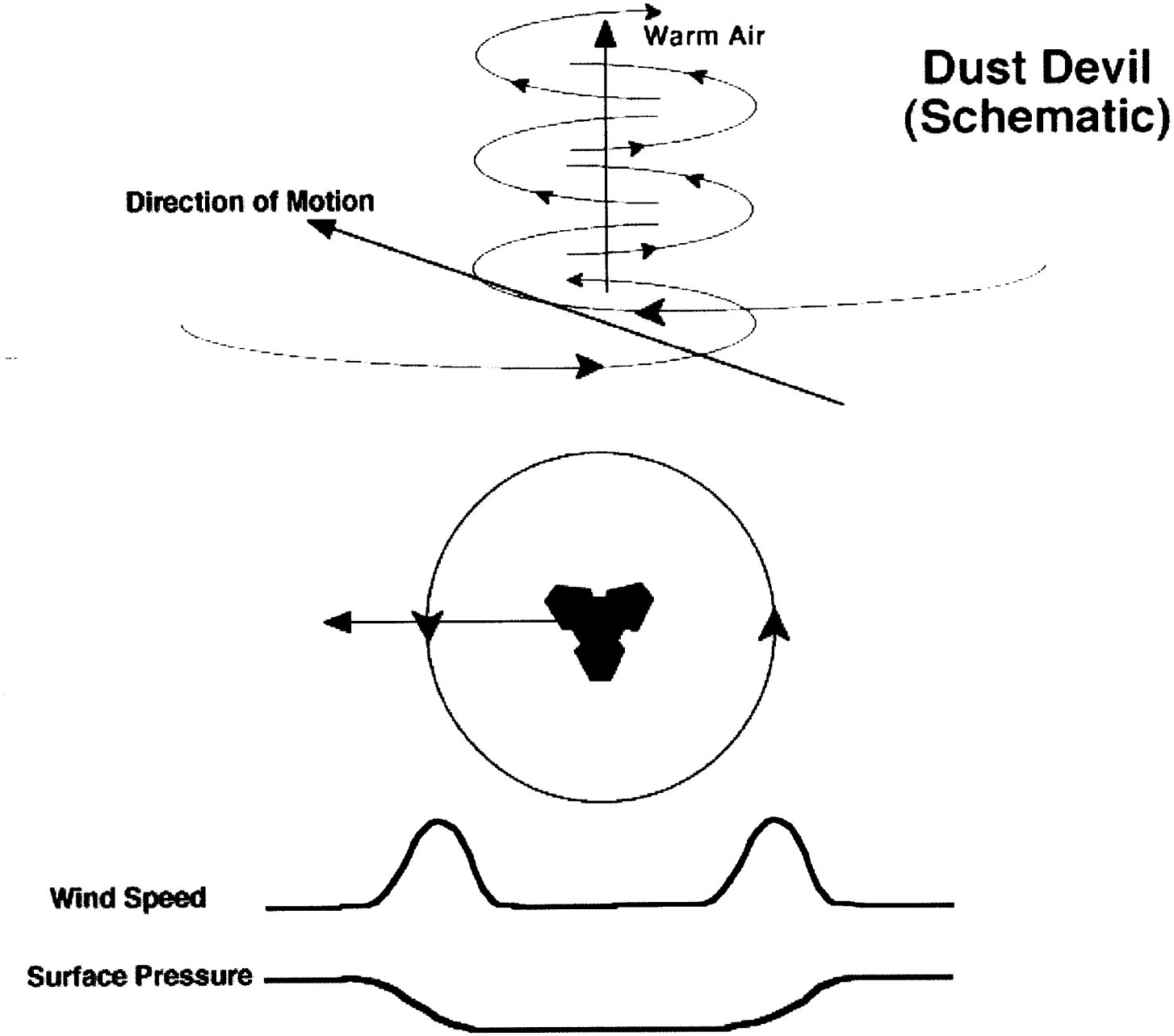

Sol 10
Sol 38
Sol 66
upper magnet
lower magnet

Temperature profile from Pathfinder Atmospheric Structure Instrument

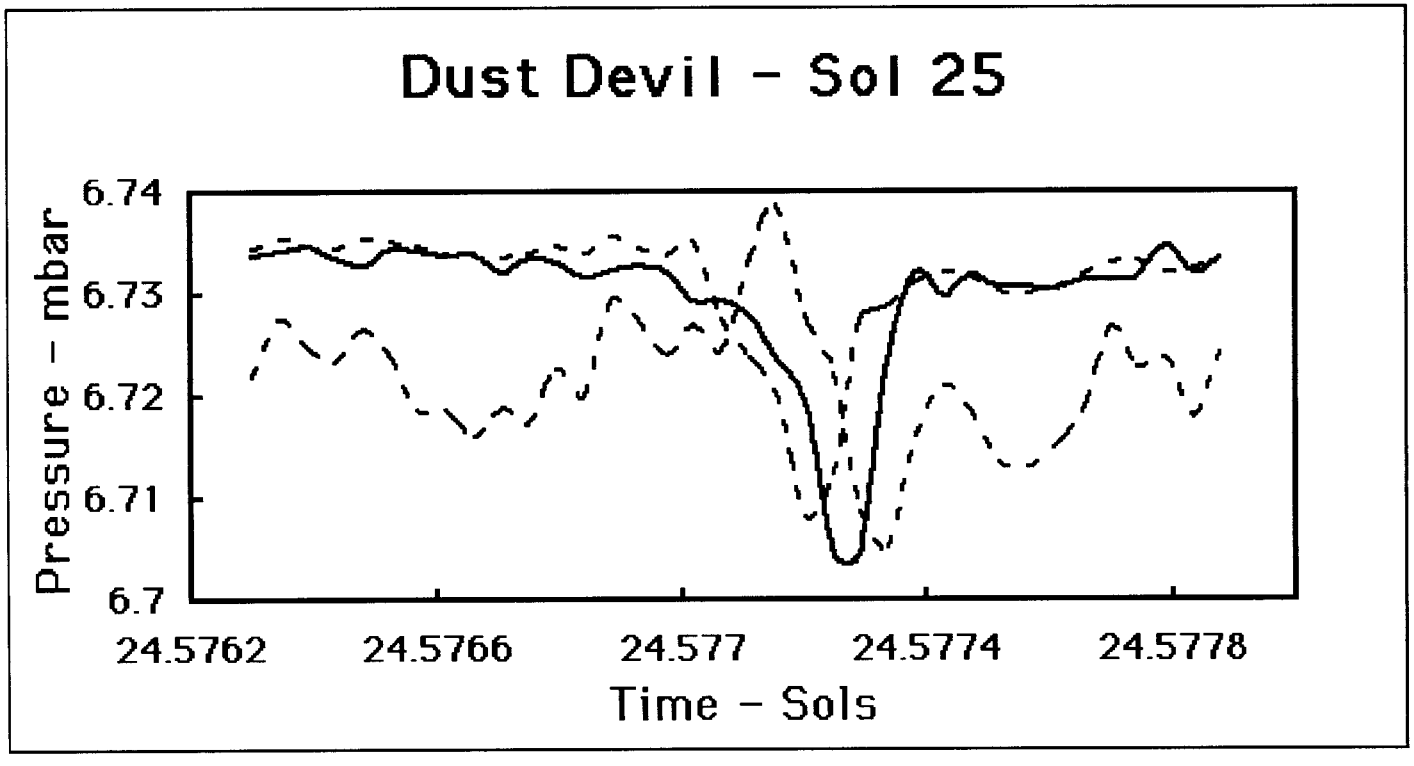


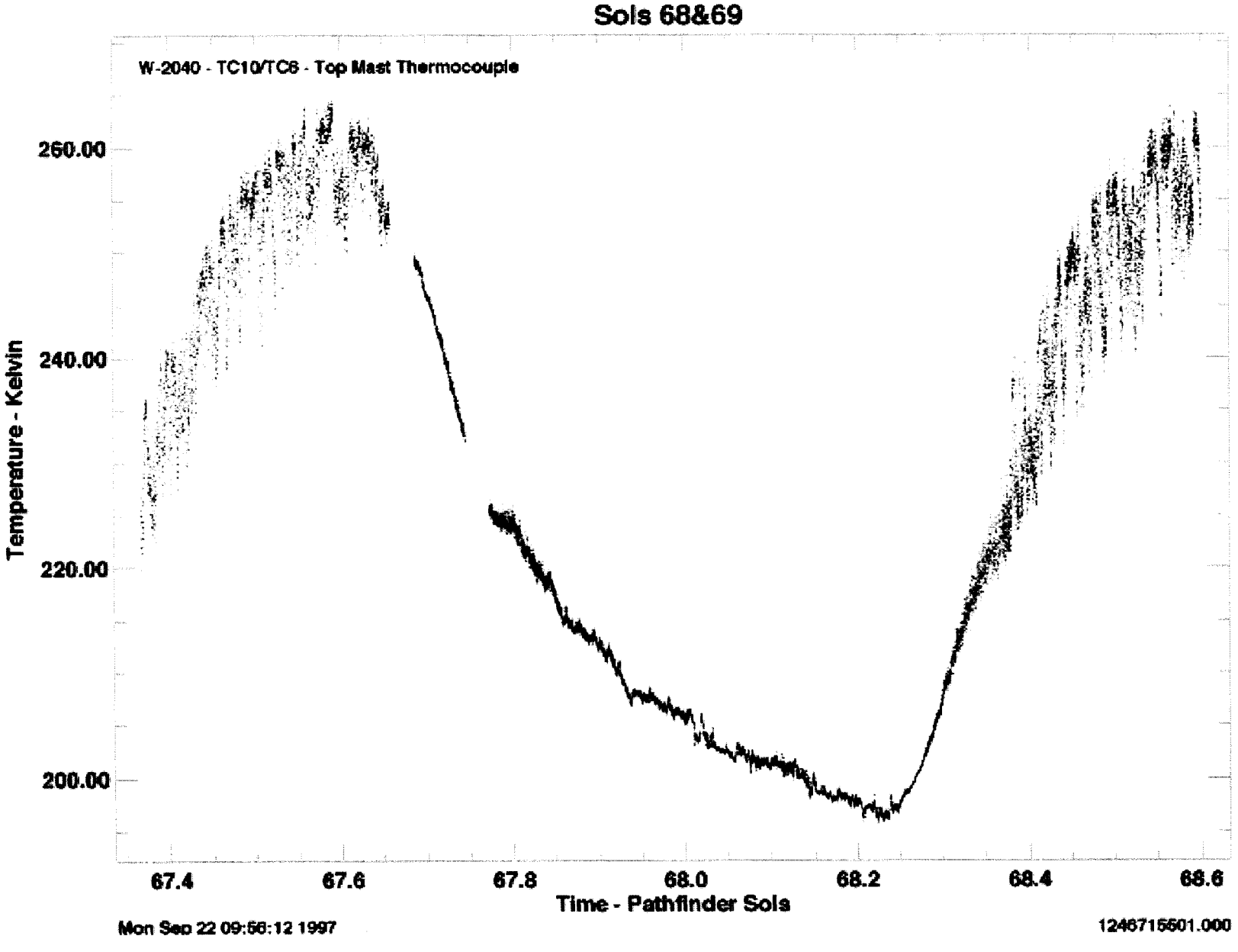

MPF
MEASURED SURFACE PRESSURE
MILLIBARS
7.2
7.1
7
6.9
6.8
6.7
6.6
6.5
0
5
10
15
20
25
SOL


Boundary Layer Sequence Temperatures
Sol 2 13:49 thru 14:03 LST
270
265
260
255
250
245
Temperature (K)
0
90
180
270
360
450
540
630
720
810
900
Seconds
1.0 m
0.5 m
0.25 m

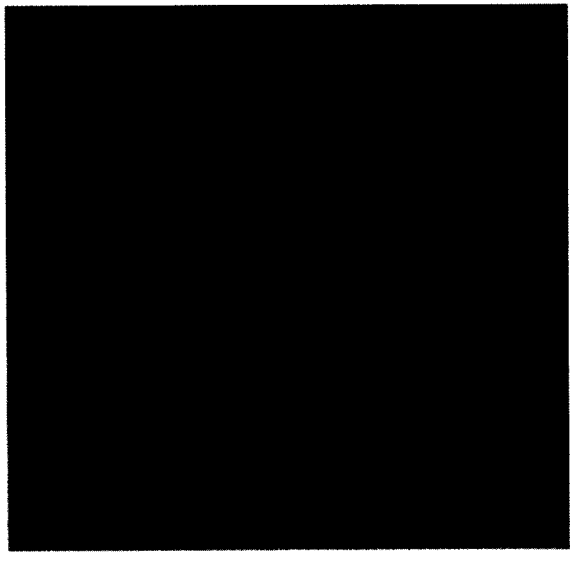


http://mars.jpl.nasa.gov/MPF/ops/dustdevil.gif


Dust Devil - Sol 25
Pressure - mbar
6.74
6.73
6.72
6.71
6.7
24.5762
24.5766
24.577
24.5774
24.5778
Time - Sols



http://mars.jpl.nasa.gov/MPF/ops/sol69-1.jpg



http://mars.jpl.nasa.gov/MPF/ops/earth_here.gif